

Serial No.: 09/792,360

Art Unit 2661

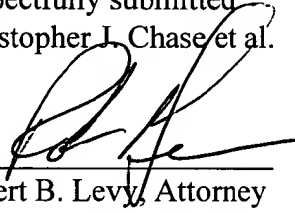
IDS 2000-0660

REMARKS

In reviewing this application prior to foreign filing, applicants believe that the specification claims the amendments to the specification and claims would better point out what applicants regard as their invention. Ample antecedent basis exists for the amendments. Therefore applicants have added no new matter.

In the event that any issues remain following entry of this amendment, applicant's attorney invites the examiner to contact him (908) 221-5714 for either a personal or telephone interview if the examiner believes that such would expedite the prosecution of this application.

Respectfully submitted
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AT&T

8/22/01
Date

MARKED-UP VERSION SHOWING CHANGES

IN THE SPECIFICATION:

Page 1, lines 3-4

This invention relates to a technique enabling access to packet-based services, such as IP, Frame Relay, and ATM, through an Ethernet [P]protocol network.

Page 1, lines 13-20

As an alternative to private line access, communications service providers such as AT&T also offer virtual circuit access allowing several customers to logically share a single circuit, thus reducing costs. Such shared circuits, typically referred to as Permanent Virtual Circuits, allow communication service providers to guarantee customer traffic flows that are distinguishable from each other, are secure, and allow customers to enjoy different service features. An example of such a technique for offering such shared service [in a Multi-Protocol Label Switching Network] is disclosed in U.S. Patent 6,081,524, assigned to AT&T.

Page 2, lines 8-20

Briefly, in accordance with a preferred embodiment, a method is provided for routing data in an Ethernet protocol network having a plurality of platforms, each serving one or more customers. A first platform receives at least one frame from a sending site (e.g., a first customer's premises) that is destined for a receiving site (e.g., another premises belonging to the same or a different customer.) After receiving the frame, the first platform overwrites a portion of the frame with a **customer descriptor** that specifically identifies the sending customer. In practice, the first platform [will] may overwrite a Virtual Local Area Network (VLAN) field that is typically employed by the

sending customer for the purposes of routing data among various VLANs at the sending premises [premises]. Rather than overwrite the VLAN field in the frame, the first platform could overwrite another field, such as the source address field, or could even employ a “shim” header containing the customer descriptor. All further use of the term **customer descriptor** implies that any of the above or similar techniques could be used.

Page 2, lines 21-28, page 3, lines 1-2

After overwriting the frame with the customer descriptor, the sending platform routes the frame onto the MAN [network] for routing among the other platforms, thereby sharing trunk bandwidth and other resources, but logically distinct from other [customer's] customers' traffic with different customer descriptors. A destination address in the frame directs the frame to its corresponding [receiving platform] endpoint. Upon receipt of the frame, the receiving platform uses the customer descriptor to segregate the frame for delivery to the proper destination, especially in the event where different customers served by the same platform use overlapping addressing plans. Thus, the customer descriptor in each frame advantageously enables the receiving platform to distinguish between different customers served by that platform.

Page 3, lines 3-6

For traffic with a destination beyond the MAN, this method provides a convenient and efficient way to map the customer[-]descriptor to similar identifiers in a Wide Area Network (WAN), such as a Permanent Virtual Circuit (PVC), a Virtual Private Network (VPN), or an MPLS Label Switched Circuit.

Page 3, lines 7-13

Overwriting each frame with the customer[-]descriptor thus affords the ability to logically segregate traffic on the Ethernet MAN to provide Virtual Private Network (VPN) services of the type offered only on more expensive Frame Relay and ATM networks. Moreover, the customer descriptor used to tag each frame can advantageously include Quality of Service (QoS) information, allowing the sender to specify different QoS levels for different traffic types, based on the Service Level Agreement (SLA) between the customer and the communications service provider.

Page 3, lines 15-17

FIGURE 1 depicts an Ethernet [P]protocol Metropolitan Area Network (MAN) in which each [information] frame is tagged with a customer descriptor in its VLAN field in accordance with the present principles;

Page 3, lines 18-19

FIGURE 2 illustrates a sample [information] frame for transmission over the network of FIG. 1;

Page 3, lines 24-26

FIGURE 5 illustrates a portion of a MAN showing the manner in which [information] frames are mapped to different Permanent Virtual Circuits by an ATM switch;

Page 3, lines 27-29

FIGURE 6 illustrates a portion of a MAN showing the manner in which [information] frames are mapped into different Multi-Protocol Label Switching (MPLS) tunnels; and

Page 4, lines 1-2

FIGURE 7 illustrates a portion of a MAN showing the manner in which [information] frames are mapped into different service networks.

Page 4, lines 4-10

FIGURE 1 depicts an Ethernet Protocol Metropolitan Area Network (MAN) 10 comprised of a plurality of Multi-Service Platforms (MSPs) 12_1 - 12_n where n is an integer, each MSP taking the form of an Ethernet switch or the like. In the illustrated embodiment $n=4$, although the network 10 could include a smaller or larger number of MSPs. A fiber ring or SONET ring infrastructure 14 connects the platforms 12_1 - 12_4 in daisy-chain fashion allowing each MSP to statistically multiplex information onto, and to statistically de-multiplex[ing] information off the ring infrastructure 14.

Page 4, lines 11-21

Each of MSPs 12_1 - 12_3 serves at least one, and in some instances, a plurality of premises 16 belonging to one or more customers. In the illustrated embodiment of FIG. 1, the MSP 12_1 serves a single customer premises 16_1 belonging to customer 1 whereas, the MSP 12_2 serves premises 16_2 and 16_3 belonging to customers 2 and 3, respectively. The MSP 12_3 serves a single premises 16_4 that belongs to customer 3. The MSPs 12_1 - 12_3 are linked to their corresponding premises via 10, 100 or 1000 MB links [18] 19.

The MSP 12₄ bears the legend "CO MSP" because it serves as a central office to route traffic from the MAN 10 to a Provider Edge Router (PER) 18 for delivery to other networks, such as Frame Relay, ATM, MPLS networks or the Internet as discussed hereinafter. By the same token, the PER 18 can route traffic from such other networks onto the MAN 10 via the CO MSP 12₄.

Page 4, lines 22-29

The traffic routed onto and off of the MAN 10 by each MSP takes the form of one or more [information] frames 20 depicted in FIG. 2. Heretofore, traffic routed onto the MAN [network] 10 from a particular customer's premises was combined with other customer[']s' traffic with no logical separation, thus raising security concerns. Moreover, since all customers' traffic share the same bandwidth, difficulties existed in prior art Ethernet MANs in regulating the traffic from each customer's premises, and in affording different customers different Quality of Service (QoS) levels in accordance with individual Service Level Agreements.

Page 5, lines 1-8

These difficulties are overcome in accordance with the present principles by "tagging" each frame 20 routed onto the [network] MAN 10 at a particular MSP, say MSP 12₃, with a customer descriptor 22' (best seen in FIG. 2) that identifies the customer sending that frame. As discussed in greater detail below, each MSP receiving a frame 20 on the fiber ring infrastructure 14 uses the customer descriptor 22' in that frame to maintain distinct routing and addressing tables that are assigned to each customer served by that MSP. This permits each customer to use [their] its own addressing plan without fear of overlap with other customers, as the[y] customers are all maintained as logically separate.

Page 5, lines 9-15

FIGURE 2 depicts the structure of an exemplary Ethernet protocol frame 20 specified by Ethernet Standard 802.1Q. Among the blocks of bytes within each frame 20 is a Virtual Local Area Network (VLAN) Identifier 22 comprised of sixteen bits. In practice, the VLAN identifier 22, in conjunction with a VLAN flag [block] 23 within the frame, facilitates routing of the frame within a customer's premises to a particular VLAN. However, the VLAN identifier 22 has no influence on routing of the frame 20 after receipt at a MSP.

Page 5, lines 16-28

In accordance with the present principles, the prior disadvantages associated with conventional Ethernet networks, namely the lack of security and inability to regulate QoS levels, are overcome by overwriting the VLAN identifier 22 in each frame 20 with the customer descriptor maintained by the service provider. Overwriting the VLAN identifier 22 of FIG. 2 of each frame 20 with the customer descriptor 22' serves to "tag" that frame with the identity of its sending customer [identity], thus affording each MSP in the [network] MAN 10 the ability to route those frames only among the premises belonging to that same sending customer. Such tagging affords the operator of the [network] MAN 10 the ability to provide security in connection with frames transmitted across the network, since frames with customer ID A would not be delivered to any premises of customer with ID B. As an example, two or more customers served by a single MSP may use overlapping IP addressing schemes. In the absence of any other identifier, the MSP receiving [such] frames with overlapping IP addresses lacks the ability to assure accurate delivery.

Page 5, lines 29-31, Page 6, lines 1-3

In the illustrated embodiment depicted in FIG. 2, each MSP of Fig. 1 tags [the] each outgoing frame 20 by overwriting the VLAN identifier 22 with the customer descriptor 22'. However, tagging could occur in other ways, rather than overwriting the VLAN identifier 22. For example, the source address block 25 within the frame 20 could be overwritten with the customer descriptor 22'. Alternatively, the data field [25] 21 could include a shim header comprising the customer descriptor 22'.

Page 6, lines 4-15

The tagging of each frame 20 with the customer descriptor 22' affords several distinct advantages in connection with routing of the frames through the MAN 10. First, as discussed above, the tagging affords each recipient MSP the ability to distinguish traffic destined for customers with overlapping address schemes, and thus allows for segregating traffic on the MAN 10. Further, tagging each frame 20 with the customer descriptor 22' enables mapping of the frames from a MAN 100 depicted in FIG 3 to corresponding one of a plurality of customer Virtual Private Networks 26₁-26₃ within an MPLS network 28. As seen in FIG. 3, an MSP 120₂ within the MAN 100 receives traffic from premises 160₁, 160₂, and 160₃ belonging to customer 1, customer 2 and customer 3, respectively, which enjoy separate physical links to the MSP. Upon receipt of each frame from a particular customer, the MSP 120₂ overwrites that frame with the customer descriptor 22' corresponding to the sending customer.

Page 6, lines 16-22

After tagging each [data] frame, the MSP 120₂ statistically multiplexes the frames onto the fiber ring infrastructure 14 for transmission to a CO MSP 120₄ for receipt at a destination PER 180 that serves the MPLS network 28 within which are customer Virtual

Private Networks 26₁-26₃. Using the customer descriptor 22' in each frame, the PER 180 maps the frame to the corresponding VPN identifier associated with a particular one of customer Virtual Private Networks 26₁-26₃ to properly route each frame to its intended destination.

Page 6, lines 23-31, page 7, lines 1-2

The tagging scheme of the present invention also affords the ability to route [information] frames with different QoS levels within a MAN 1000 depicted in FIG 4. As seen in FIG. 4, an MSP 1200₂ within the MAN 1000 receives traffic from premises 1600₂, and 1600₃ belonging to customer 2 and customer 3, respectively, which enjoy separate physical links to the MSP, allowing each to send [information] frames into the MAN. In the illustrated embodiment of FIG. 4, the frames originating from the premise 1600₂ may contain either voice or data and have a corresponding QoS level associated with each type of frame. Upon receiving such frames, the MSP 1200₂ overwrites the frame with the customer descriptor 22' corresponding to the particular customer sending the frame. The customer descriptor 22' will not only contain the identity of the sending customer, but the corresponding QoS level associated with that frame.

page 7, lines 3-10

After tagging each [data] frame, the MSP 1200₂ statistically multiplexes the frames onto the fiber ring infrastructure 14 for transmission to a CO-MSP 1200₄ for receipt at a destination PER 1800 that serves an MPLS network 280 within which are customer Virtual Private Networks 260₂ and 260₃. Using the customer descriptor 22' in each frame, the PER 1800 of FIG. 4 maps the frame to the corresponding customer VPN to properly route each frame to its intended customer [premises] VPN. Further, the PER 1800 of FIG. 4 also maps the QoS level specified in the customer descriptor in the frame to assure that the appropriate quality of service level is applied to the particular frame.

Page 7, lines 11-27

In the above-described embodiments, the frames of customer traffic have been assumed to comprise IP packets that terminate on a router (i.e., Provider Edge Routers 18, 180 and 1800) and that the VPNs employ MPLS-BGP protocols. However, some customers may require multi-protocol support, or may otherwise require conventional PVCs so that the traffic streams must be mapped into Frame Relay or ATM PVCs as depicted in FIG. 5, which illustrates a portion of a MAN 10000 having a CO MSP 12000₄ serving an ATM switch 30 that receives traffic from the MAN. As seen in FIG. 5, each of premises 16000₁, 16000₂ and 16000₃ belonging to customer 1, customer 2 and customer 3, respectively, [5] may [originate information] send frames for receipt at MSP 12000₂ in the MAN 10000. The MSP 12000₂ tags each frame with the corresponding customer descriptor prior to statistically multiplexing the data for transmission on the fiber ring infrastructure 14 to the CO MSP 12000₄ for receipt at the ATM switch 30. The ATM switch 30 then maps [the] each frame to the appropriate PVC in accordance with the customer descriptor 22' in the frame in a manner similar to the mapping described with respect to FIG. 3. Thus, the ATM switch 30 could map the frame to one of Frame Relay recipients' 32₁, 32₂, or 32₃, ATM recipients 32₄ or 32₅, or IMA (Inverse Multiplexing over ATM) recipient 32₆.

Page 7, lines 28-31, Page 8, lines 1-6

FIG. 6 depicts a portion of a MAN network 100000 that routes frames onto separate MPLS tunnels 40₁-40₃ (each emulating a private line 32 in an MPLS network 28000) in accordance with the customer descriptor 22' written into each frame by a MSP 120000₂ in the MAN. Each of customer premises 160000₁, 160000₂ and 160000₃ depicted in FIG. 6 [originate] sends information frames for receipt at MSP 120000₂. The MSP 120000₂ tags each frame with the customer descriptor prior to statistically multiplexing

the data for transmission on the fiber ring infrastructure 14 for delivery to a CO MSP 120000₄ that serves a PER 18000. The PER 18000 translates (maps) the customer descriptors written onto the frames by the MSP 120000₂ into the MPLS tunnels 40₁-40₃ to enable the PER to route the traffic to the intended customer.

Page 8, lines 7-17

FIG. 7 depicts a portion of a MAN network 1000000 for routing traffic (i.e., [information] frames) onto separate networks in accordance with the customer descriptor written into each the frame by a MSP 120000₂ in the MAN. Each of customer premises 1600000₂ and 1600000₃ depicted in FIG. 7 [originates information] sends frames for receipt by the MSP 1200000₂. The MSP 1200000₂ tags each frame with the customer descriptor 22' prior to statistically multiplexing the data for transmission on the fiber ring infrastructure 14 for delivery to a CO MSP 1200000₄ that serves a PER 180000. In accordance with the customer descriptor, the PER 1800000 of FIG. 7 routes traffic to a particular one of several different networks, e.g., an Intranet VPN 42₁, a voice network 42₂ and the Internet 42₃, in accordance with the customer descriptor 22' written onto the frame by the MSP 1200000₂.

IN THE CLAIMS:

- 1 1. (amended) A method for routing at least one frame from [In an] one Ethernet
2 protocol network to at least one other network, each network having at least one [plurality
3 of] platform[s, each] serving at least one [a plurality of] customer[s], associated with a
4 Virtual Local Area Network (VLAN), such that the [a method of routing at least one
5 information] frame passes from [at least] one sending customer [site] associated with a
6 first VLAN served by a first platform to at least one receiving customer [site] associated
7 with a second VLAN served by a second platform, comprising the steps of:

8 (a) receiving at said first platform said one frame from said one sending customer;

9 (b) [overwriting] modifying said one frame with a customer descriptor that
10 identifies said sending customer;

11 (c) using the customer descriptor to map a path from the first platform to the
12 second platform; and

13 (d) routing the frame on the path [on the network to said second platform; and

14 (d) delivering the frame to the receiving customer site by mapping the customer
15 descriptor to the receiving customer].

1 2. (amended) The method according to claim 1 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of] mapping the
3 customer descriptor to a customer Virtual Private Network[s] (VPN) [associated with the
4 receiving customer].

1 3.(amended) The method according to claim 1 further including the steps of:
2 providing the customer descriptor with a quality of service indicator that specifies
3 the quality of service level afforded to the [accepted] frame; and
4 transmitting the frame to the receiving customer with the quality of service level specified
5 by the quality of service indicator provided within the customer descriptor.

1 4. (amended) The method according to claim 1 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of] mapping the
3 customer descriptor to a corresponding one of a plurality of Frame Relay and ATM
4 Permanent Virtual Circuits [associated with the receiving customer].

1 5. (amended) The method according to claim 1 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of] mapping the
3 customer descriptor to one of a plurality of Multi-Protocol Label Switching tunnels
4 [associated with the receiving customer].

1 6. (amended) The method according to claim 1 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of] mapping the
3 customer descriptor to one of a plurality of different service networks [associated with the
4 receiving customer].

1 7. (amended) The method according to claim 1 wherein the step of [overwriting]
2 modifying the frame includes the step of overwriting a Virtual LAN [Identifier] (VLAN)
3 Identifier field within the frame.

1 8. (amended) The method according to claim 1 wherein the step of [overwriting]
2 modifying the frame includes [the step of] overwriting a source address field within the
3 information frame.

1 9. (amended) The method according to claim 1 wherein the step of [overwriting]
2 modifying the frame includes [the step] inserting a shim header containing the customer
3 descriptor.

1 10. (amended) A method for routing at least one frame from [In an] one Ethernet
2 protocol network to at least one other network, each network having at least one [plurality
3 of] platform[s, each] serving at least one [a plurality of] customer[s], associated with a
4 Virtual Local Area Network (VLAN), such that the [a method of routing at least one
5 information] frame passes from [at least] one sending customer associated with a first
6 VLAN served by a first platform to at least one receiving customer associated with a
7 second VLAN served by a second platform, comprising the steps of:

8 (a) receiving at said first platform said one frame from said one sending customer,
9 said one frame containing a Virtual LAN [identifier] (VLAN) identifier field;

10 (b) overwriting VLAN identifier field in said one frame with a customer
11 descriptor that identifies said sending customer;

- 12 c) using the customer descriptor to map a path from the first platform to the
13 second platform; and
14 (d) routing the frame on the path [on the network to said second platform; and
15 (d) delivering the frame to the receiving customer site by mapping the customer
16 descriptor to the receiving customer].

1 11. (amended) The method according to claim 10 wherein the [mapping] step of
2 using the customer descriptor to map the path includes the step of mapping the customer
3 descriptor to a customer Virtual Private Network[s] (VPN) [associated with the receiving
4 customer].

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1 12. (amended) The method according to claim 10 further including the steps of:
2 providing the customer descriptor with a quality of service indicator that specifies
3 the quality of service level afforded to the [accepted] frame; and
4 transmitting the frame to the receiving customer with the quality of service level specified
5 by the quality of service indicator provided within the customer descriptor.

1 13. (amended) The method according to claim 10 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of]mapping the
3 customer descriptor to a corresponding one of a plurality of Frame Relay and ATM
4 Permanent Virtual Circuits [associated with the receiving customer].

1 14. (amended) The method according to claim 10 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of] mapping the
3 customer descriptor to one of a plurality of Multi-Protocol Label Switching tunnels
4 [associated with the receiving customer].

1 15. (amended) The method according to claim 10 wherein the [mapping] step of
2 using the customer descriptor to map the path includes [the step of] mapping the
3 customer descriptor to one of a plurality of different service networks [in associated with
4 the receiving customer].

1 16. (amended) An Ethernet protocol network comprising:
2 a fiber ring infrastructure; and
3 a plurality of platforms coupled to the fiber ring infrastructure, each platform
4 serving at least one customer for statistically multiplexing [information] frames onto the
5 fiber ring infrastructure from said one customer and for statistically de-multiplexing
6 [information] frames off the fiber ring infrastructure to the one customer
7 wherein each platform sending a frame overwrites said frame with a customer
8 descriptor that identifies the sending customer and routes the frame on a path obtained by
9 mapping the customer descriptor to such path [the network to a receiving site; and
10 wherein each platform delivering a frame to the receiving customer does so by
11 mapping the customer descriptor to the receiving customer].
12

13 17. (amended) The apparatus according to claim 16 wherein the receiving
14 platform maps the customer descriptor through a provider edge router to a [customer]
15 Virtual Private Network[s] (VPN) [associated with the receiving customer].

1 18. (unamended) The apparatus according to claim 16 wherein the customer
2 descriptor includes quality of service level information.

1 19 (amended). The apparatus according to claim 16 wherein the receiving
2 platform maps the customer descriptor through an ATM switch router to a corresponding
3 one of a plurality of Frame Relay and ATM Permanent Virtual Circuits [associated with
4 the receiving customer].

1 20. (amended) The apparatus according to claim 16 wherein the receiving
2 platform maps the customer descriptor through a provider edge router to one of a plurality
3 of Multi-Protocol Label Switching tunnels [associated with the receiving customer].

1 21. (amended) The apparatus according to claim 16 wherein the receiving
2 platform maps the customer descriptor through a provider edge router to one of a plurality
3 of different service networks [in associated with the receiving customer].

1 22. (amended) The apparatus according to claim 16 wherein the sending platform
2 overwrites a Virtual LAN [Identifier] (VLAN) identifier field within the frame with the
3 customer descriptor.

1 23. (amended) The apparatus according to claim 16 wherein the sending platform
2 overwrites a source address field within the [information] frame with the customer
3 descriptor.

1 24. (unamended) The method according to claim 16 wherein the sending
2 platform inserts into the frame a shim header containing the customer descriptor.

Add Claim 25

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1 25. In an Ethernet protocol network having a plurality of platforms, with at least a
2 first second platforms serving a group of members, a method of routing at least one frame
3 from at least one sending member of group served by a first platform to at least one
4 receiving member of the served by a second platform, comprising the steps of:

5 (a) receiving at said first platform said at least one frame from said sending
6 member;

7 (b) modifying said one frame with a customer descriptor that identifies said group
8 of members;

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- 9 (c) mapping the customer descriptor to a path in the network between first and
10 second platforms; and
11 (d) routing the frame on the path to the receiving member served by the second
12 platform. --